

Enhancements to NASA's Land Atmosphere Near real-time Capability for EOS (LANCE):

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Abstract

NASA's Land, Atmosphere Near real-time Capability for EOS (LANCE) supports application users interested in monitoring a wide variety of natural and man-made phenomena. Near Real-Time (NRT) data and imagery from the AIRS, AMSR2, MISR, MLS, MODIS, OMPS, OMI and VIIRS instruments are available much quicker than routine processing allows. Most data products are available within 3 hours from satellite observation. NRT imagery are generally available 3-5 hours after observation. This article describes the LANCE and the enhancements made to the LANCE over the last year. These enhancements include the addition of NRT products from AMSR2, MISR, OMPS and VIIRS. In addition, the selection of LANCE NRT imagery that can be interactively viewed through Worldview and the Global Imagery Browse Services (GIBS) has been expanded. Next year, data from the MOPITT will be added to the LANCE. For more information visit: <https://earthdata.nasa.gov/lance>

What is LANCE?

LANCE provides global Imagery and data for Near Real-Time Applications from AIRS, AMSR2, MISR, MLS, MODIS, OMI, OMPS and VIIRS



LANCE provides data and imagery in support of applications such as: Air Quality - Dust storms - Fires - Vegetation for agricultural monitoring - Floods - Ash Plumes - Drought - Smoke Plumes - Sea ice for shipping - Severe Storms

LANCE was established in 2009, building on the success of MODIS Rapid Response. LANCE is a component of EOSDIS, NASA's Earth Observing System Data and Information System. It is a virtual system that leverages existing science led processing and data centers.

LANCE NRT Products

Instrument	Product Categories	Average Latency
Atmospheric Infrared Sounder (AIRS)	Radiances, Temperature, Moisture Profiles, Precipitation, Dust, Clouds and Trace Gases	75 - 140 minutes
Advanced Microwave Scanning Radiometer 2 (AMSR2)	Global Total Precipitation, Global Rainfall, Total Precipitable Water (TPW), Ocean Wind Speed (OWS), Columnar Cloud Liquid Water (CLW) over ocean, Columnar Water Vapor (CWV) over ocean, Snow Water Equivalent (SWE), Sea Ice Concentration, Brightness Temperature (TB), Soil Moisture	75 - 165 minutes**
Multi-angle Imaging Spectro-Radiometer (MISR)	Cloud motion vectors (Winds), Radiances	90 - 120 minutes
Microwave Limb Sounder (MLS)	Ozone, Temperature, Carbon Monoxide, Water Vapor, Nitric Acid, Nitrous Oxide, Sulfur Dioxide	75 - 140 minutes
Moderate Resolution Imaging Spectroradiometer (MODIS)	Radiances, Clouds/Aerosols, Water Vapor, Fire, Snow Cover, Sea Ice, Land Surface Reflectance, Land Surface Temperature	60 - 125 minutes*
Coming Soon: Ozone Mapping and Profiler Suite (OMPS)	Total Column Ozone and Aerosol Index, Sulfur Dioxide, Ozone Profile	180 minutes***
Ozone Monitoring Instrument (OMI)	Ozone, Sulfur Dioxide, Aerosols, Cloud Top Pressure	100 - 165 minutes**
Visible Infrared Imaging Radiometer Suite (VIIRS)	375 m Active Fire, Corrected Reflectance Imagery, Land Surface Reflectance Coming soon: Snow, Land Surface Temperature, Sea Ice and Ice Surface Temperature	180 minutes***

* Latency excludes daily Land Surface Reflectance

** Latency excludes Level 3 products

*** It is anticipated that this initial latency will be reduced

What's new in LANCE?

Planned products from MOPITT

Near real-time data from the Measurements Of Pollution in the Troposphere (MOPITT) instrument will be added to LANCE in 2017. MOPITT measures CO from the surface to the upper troposphere, which is a chemically reactive gas that has a lifetime of approximately one month. Primary sources of CO include biomass burning (for example, forest fires) and fossil fuel burning, which can have large temporal fluctuations. Near real time (NRT) CO products are useful for air quality forecasting and in field campaign planning.

New products from AMSR2, MISR, OMPS and VIIRS

AMSR2 Data from AMSR2, an instrument on the Japanese GCOM-W1 satellite, is providing a research-quality global dataset for the climate research and weather forecasting community. In 2016, 4 additional NRT products have been made available through LANCE.

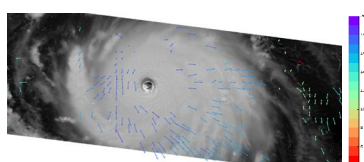
NRT AMSR2 Products Added to LANCE in 2016

Description
NRT AMSR2 Daily L3 6.25 km 89 GHz Brightness Temperature (Tb) Polar Grids
NRT AMSR2 Daily L3 12.5 km Tb, Sea Ice Concentration and Snow Depth Polar Grids
NRT AMSR2 Daily L3 25 km Tb and Sea Ice Concentration Polar Grids
NRT AMSR2 Unified L2B Half-Orbit 25 km EASE-Grid Surface Soil Moisture

This completes the suite of AMSR2 NRT products. As the AMSR2 standard quality products are released from NASA, the expedited (NRT) products from LANCE may be updated to reflect algorithm improvements.

MISR

NRT Level 2 MISR Winds products are now available through LANCE. MISR NRT Winds will be used to improve numerical weather prediction. These products include L1B2 imagery, cloud-tracked winds, and will include aerosol properties.



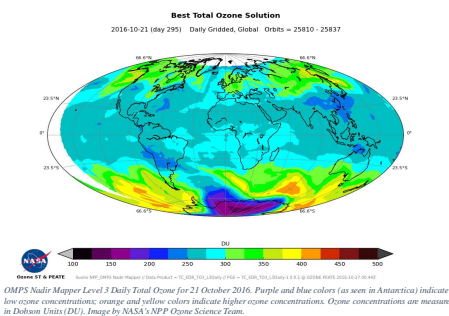
MISR image of Typhoon Nepartak captured on July 7, 2016, upon which the retrieved winds at multiple locations and heights within the storm have been superimposed. The image shows that Nepartak's center is extremely compact, rather than broken up into spiral bands as is more typical of typhoons. This means that the storm may retain more of its strength as it passes over land.

OMPS

Data from the Ozone Mapping and Profiler Suite (OMPS) aboard the Suomi National Polar-orbiting Partnership (Suomi NPP) are the newest NRT products to be made available through LANCE. The specific products are:

- NMT03 - OMPS Nadir Mapper Total Column Ozone and Aerosol Index
- NMS02 - OMPS Nadir Mapper Near Real-Time Sulfur Dioxide
- NPBUV03-L2 - OMPS Nadir Profiler Ozone Profile

All three products will provide continuity from OMI



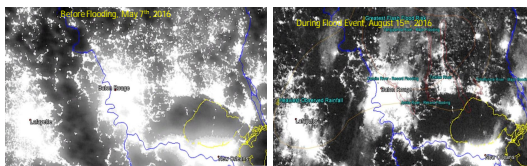
While LANCE OMPS near real-time products do not have the extensive processing required for use in scientific research, they are valuable tools for monitoring the health of the ozone layer, evaluating ultraviolet (UV) radiation intensity, and managing ongoing natural events such as the transport of dust and smoke from dust storms and biomass burning. In addition, the aerosol index and sulfur dioxide data provide critical near real-time information about the size, location, and movement of sulfur dioxide and ash clouds from volcanic eruptions, which pose hazards to people on the ground and to flying aircraft.

VIIRS

The following 6 minute granule products are now available in LANCE from the S-NPP Visible Infrared Imaging Radiometer Suite (VIIRS):

- Land Surface Reflectance (VNP09_NRT)
- Active Fire data / Thermal Anomalies (VNP14IMG_NRT) and
- Gridded Land Surface Reflectance (VNP09GA_NRT)

Additional Land and Atmosphere products will be added to LANCE over the coming months. This will include the VIIRS Day Night Band imagery which is useful for detecting blackouts. The DNB images below of southeast Louisiana were released by NASA at the request of the Federal Emergency Management Agency to determine power outages caused by the flooding on August 15, 2016. The bottom-left image shows a normal night, the bottom-right was taken the night of the flood.



http://www.nytimes.com/interactive/2016/08/22/us/louisiana-flooding-maps.html?_r=0

Accessing LANCE Data and Imagery

All LANCE data can be downloaded via FTP and/or HTTPS using links provided from <https://earthdata.nasa.gov/lance>.

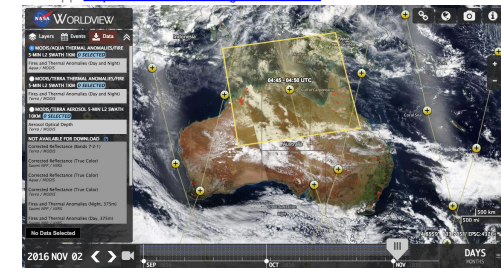
The following applications also make LANCE products available:

- Earthdata Search: Users can search for data by keyword and filter by time or space. <https://search.earthdata.nasa.gov>

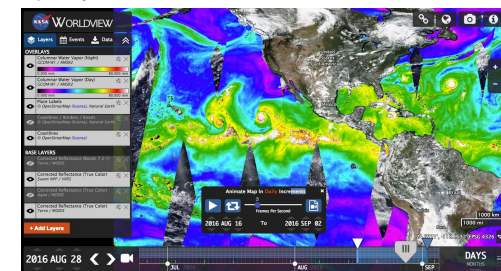


- Global Imagery Browse Services (GIBS): Provides global imagery layers to Worldview through publicly accessible and standards compliant imagery services. Users can add GIBS to their own web mapping interface or client, <https://earthdata.nasa.gov/gibs>

- Worldview: Users can interactively browse and download full resolution imagery. Underlying HDF data granules can also be downloaded from within the app: <https://earthdata.nasa.gov/worldview>

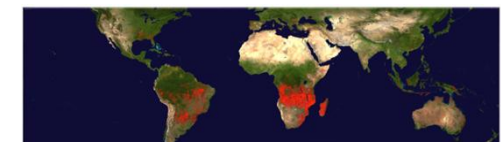


Worldview now has an Event Tracker tab enabling users to zoom to featured events and an animation capability which is a great way to demonstrate and share dynamic processes captured by the satellites.



On 8/28/2016 two tropical cyclones, Madeleine and Lester, approached the Hawaiian Islands. This rare event raised concerns for flash flooding due to observed heavy rainfall and high surf for several of the eastern islands. In the end, both tropical cyclones skirted the Hawaiian Islands, bringing only high waves and rain. This LANCE AMSR2 NRT daily columnar water vapor retrieval image was derived from measurements taken by the AMSR2 instrument onboard the GCOM-W1 satellite.

- Fire Information for Resource Management System (FIRMS): FIRMS, also part of LANCE, enables users to subscribe to fire email alerts for any area or view and download MODIS and VIIRS fire data in GIS compatible formats: <https://earthdata.nasa.gov/firms>



For More information:

LANCE: <http://earthdata.nasa.gov/lance>

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